



U.S. Army Corps
of Engineers
Tulsa District

Tulsa District



Arkansas River System Operation



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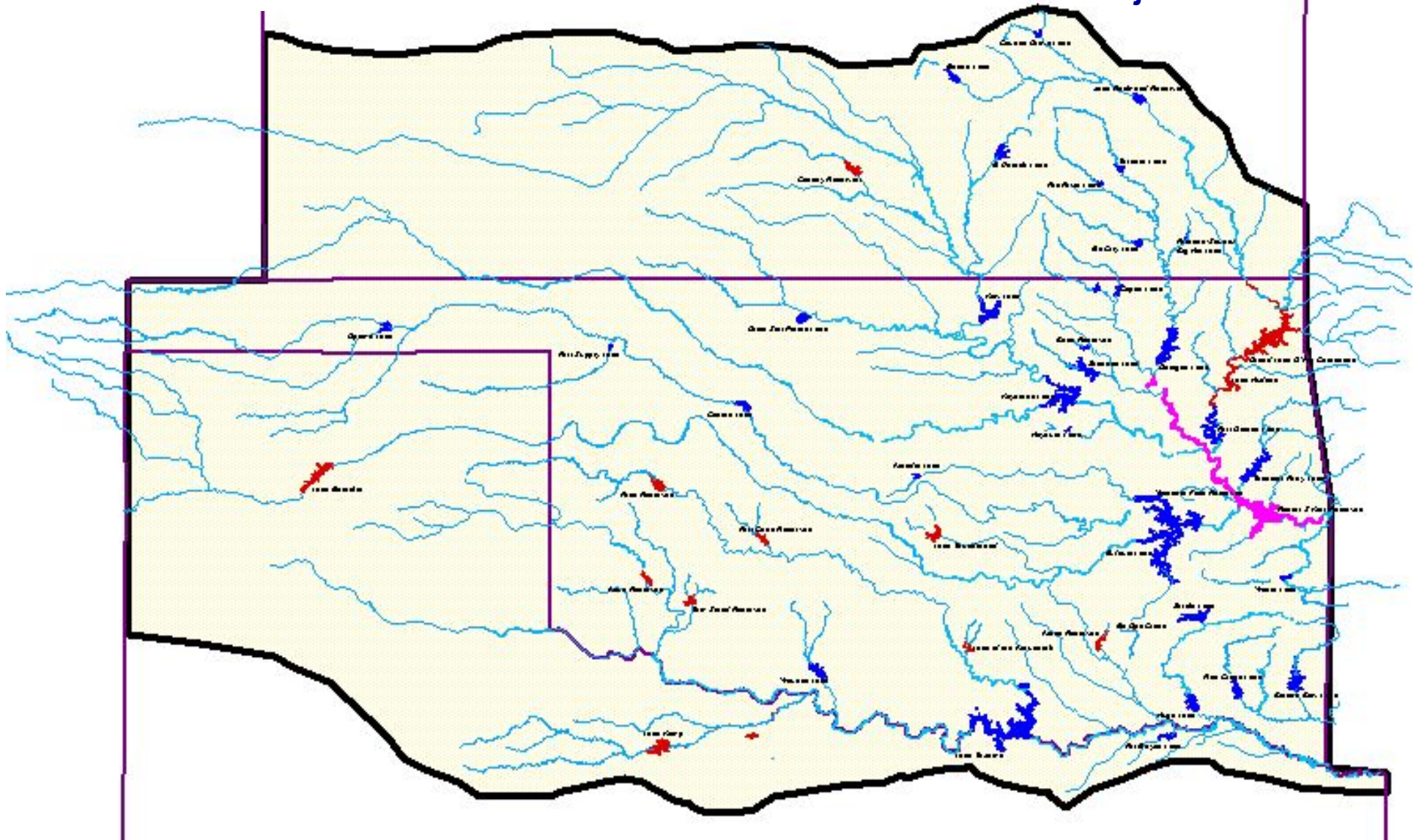
Overview



- **Tulsa District**
- **Authorized Purposes**
- **Types of projects and storage zones**
- **Flood damage risk reduction operation.**
- **Arkansas River System Operation**

Tulsa District:

- 50 Projects
 - 15 in the Red River Basin
 - 35 in the Arkansas River Basin
- 12 Section-7 lakes (owned by others)
- 23 lakes with gated spillways
- 8 COE Hydropower
- 5 Navigation Locks
- 1 Chloride Control Project





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Authorized Purposes



The Tulsa District, Corps of Engineers reservoir purposes fall into eight general categories:

- Flood Control
- Navigation
- Hydroelectric Power
- Water Supply
- Fish and Wildlife
- Water Quality
- Irrigation
- Recreation



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Competing Purposes



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Recreation



Hydropower & Flood Control



Navigation



Flood Control



Photo by Jim Zingo

Fish and Wildlife

Interior Least Tern





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Types of Projects and Storage Zones



- Tulsa District has primarily four different types of water resources projects.
 - Flood damage risk reduction projects
 - Flood damage risk reduction projects with surcharge
 - Navigation lock and dams
 - Navigation lock and dams with hydropower



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Storage Zones

Flood Damage Risk
Reduction Project



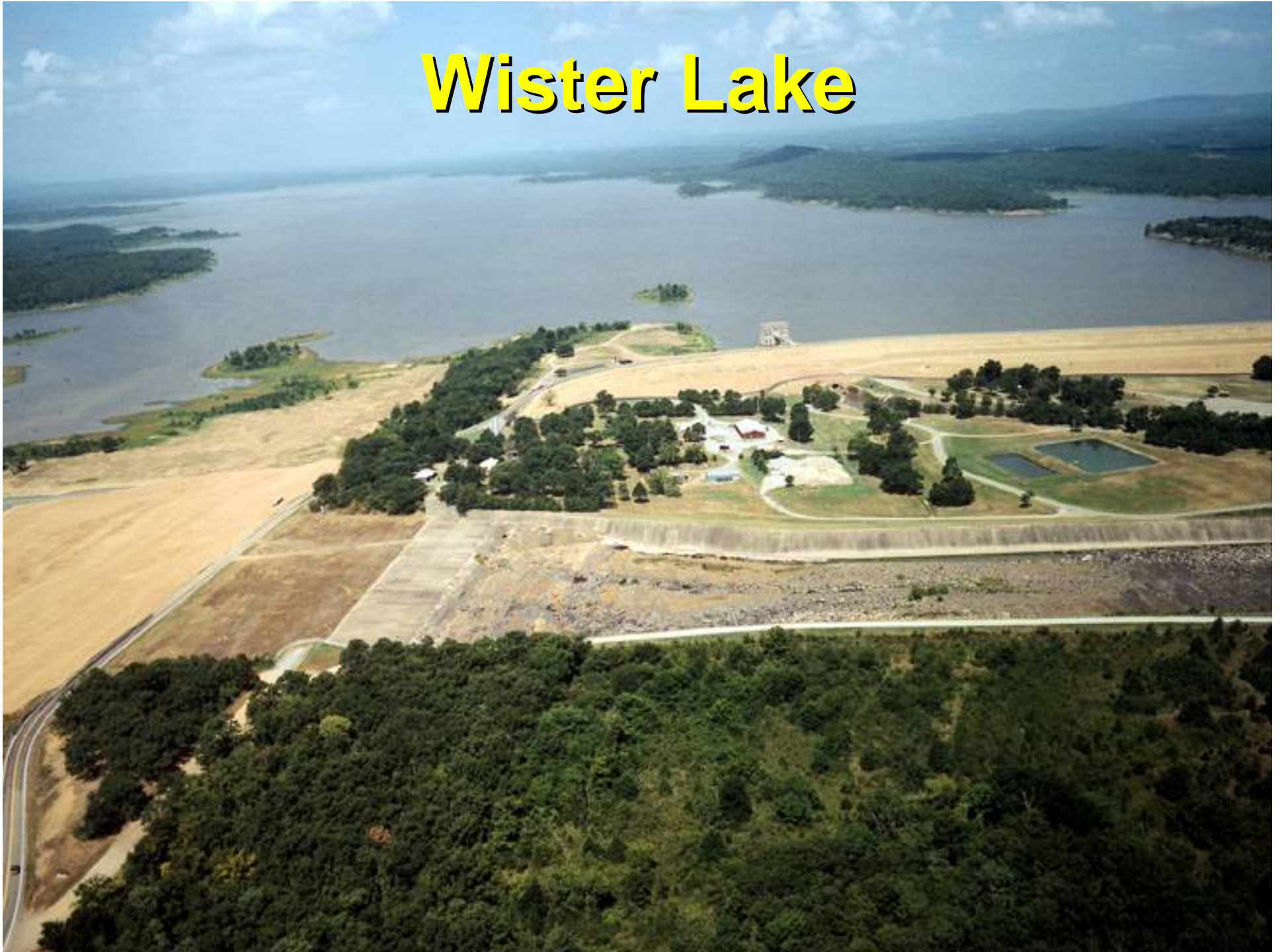
FLOOD CONTROL POOL

CONSERVATION POOL
(Hydropower pool)

INACTIVE POOL

DAM

Wister Lake



Fort Gibson Lake





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Storage Zones

Flood Damage Risk Reduction Project with Surcharge



INDUCED SURCHARGE POOL

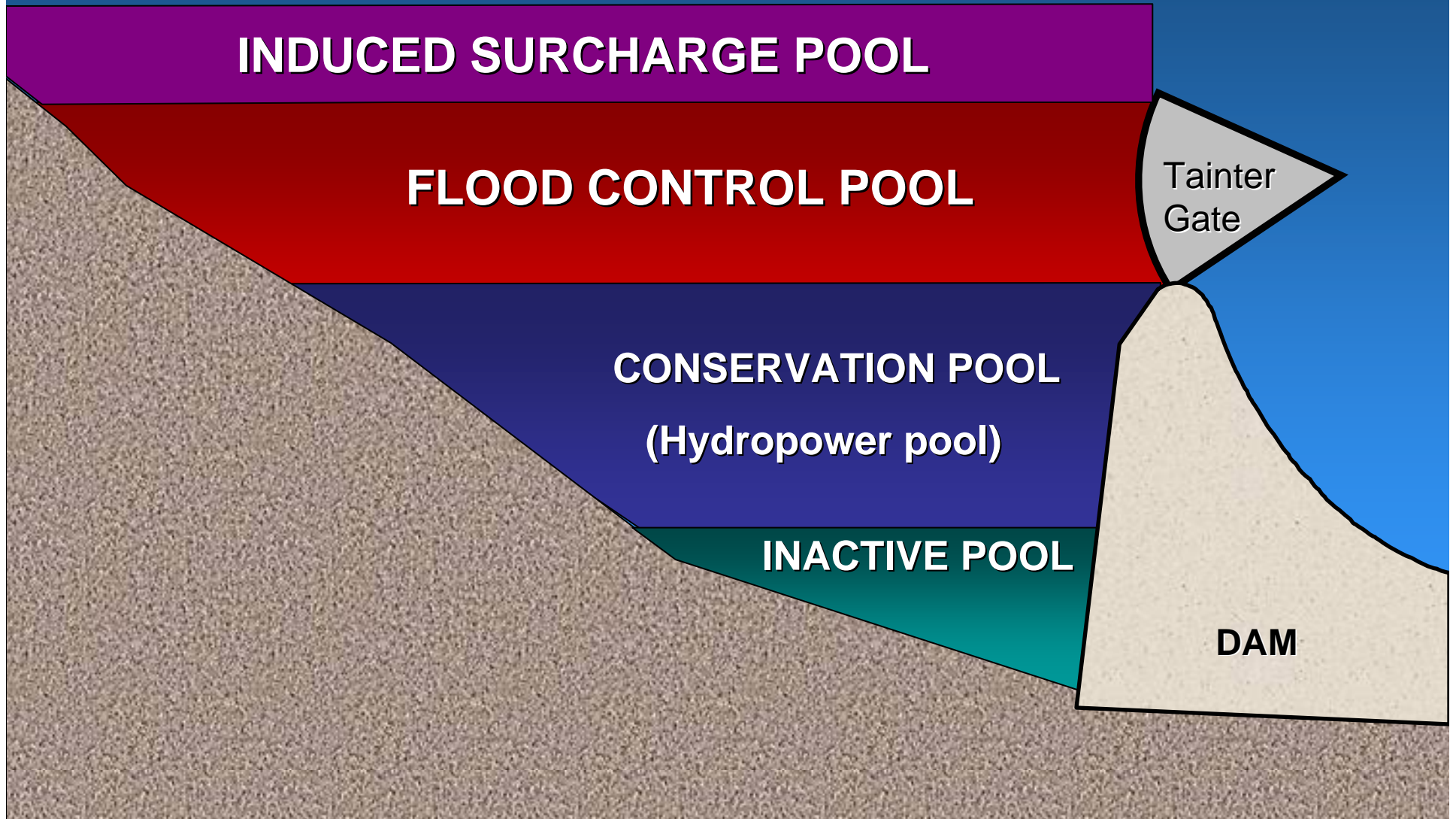
FLOOD CONTROL POOL

CONSERVATION POOL
(Hydropower pool)

INACTIVE POOL

Tainter
Gate

DAM





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Storage Zones

Flood Damage Risk Reduction Project with Surcharge



INDUCED SURCHARGE POOL

FLOOD CONTROL POOL

CONSERVATION POOL
(Hydropower pool)

INACTIVE POOL

Tainter
Gate

Flood Releases

DAM

Keystone Lake



7/26/2000 1:49pm



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Storage Zones

Navigation Lock and Dam

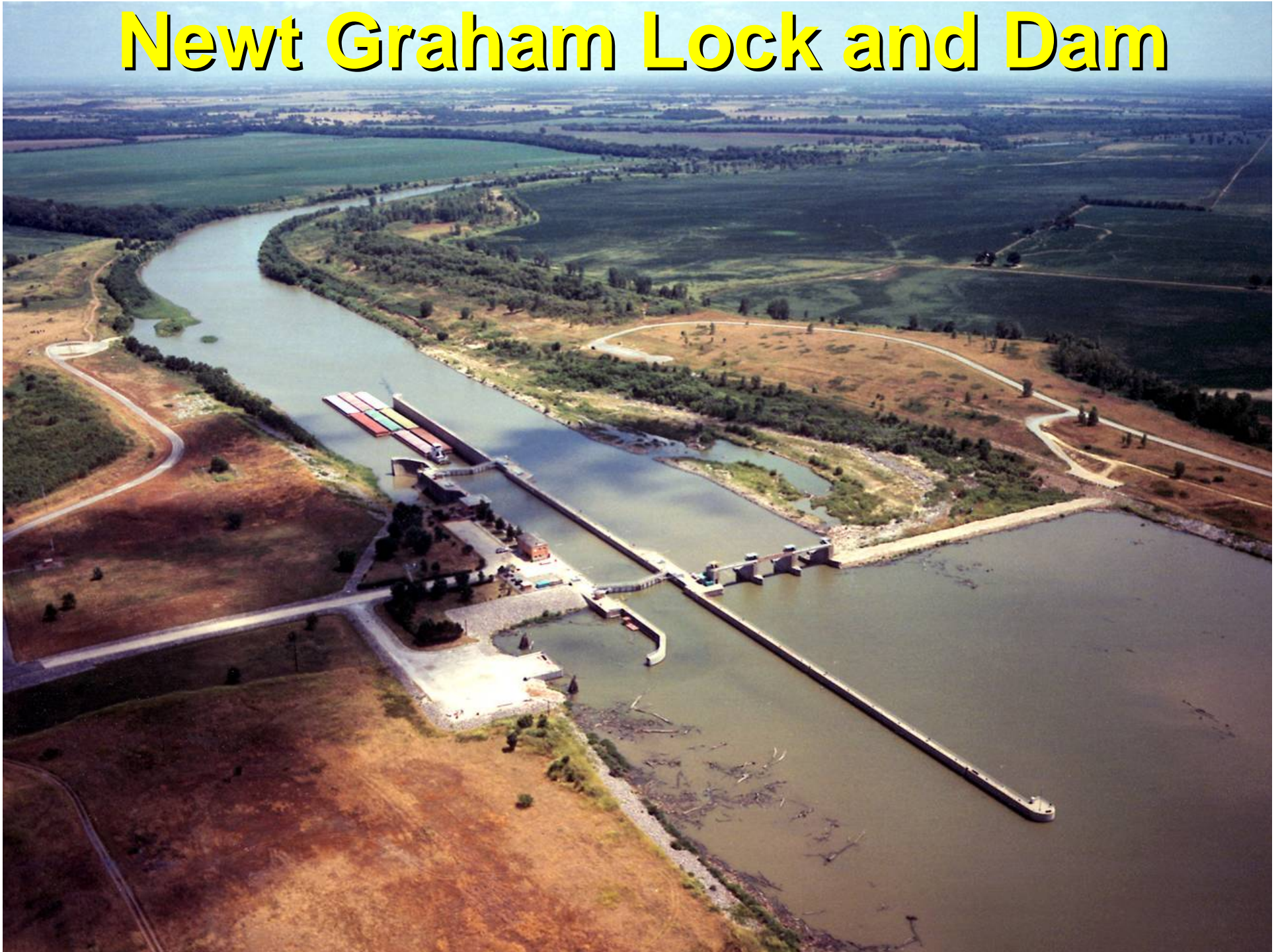


NAVIGATION POOL

INACTIVE POOL

DAM

Newt Graham Lock and Dam





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Storage Zones Navigation Lock and Dam with Hydropower



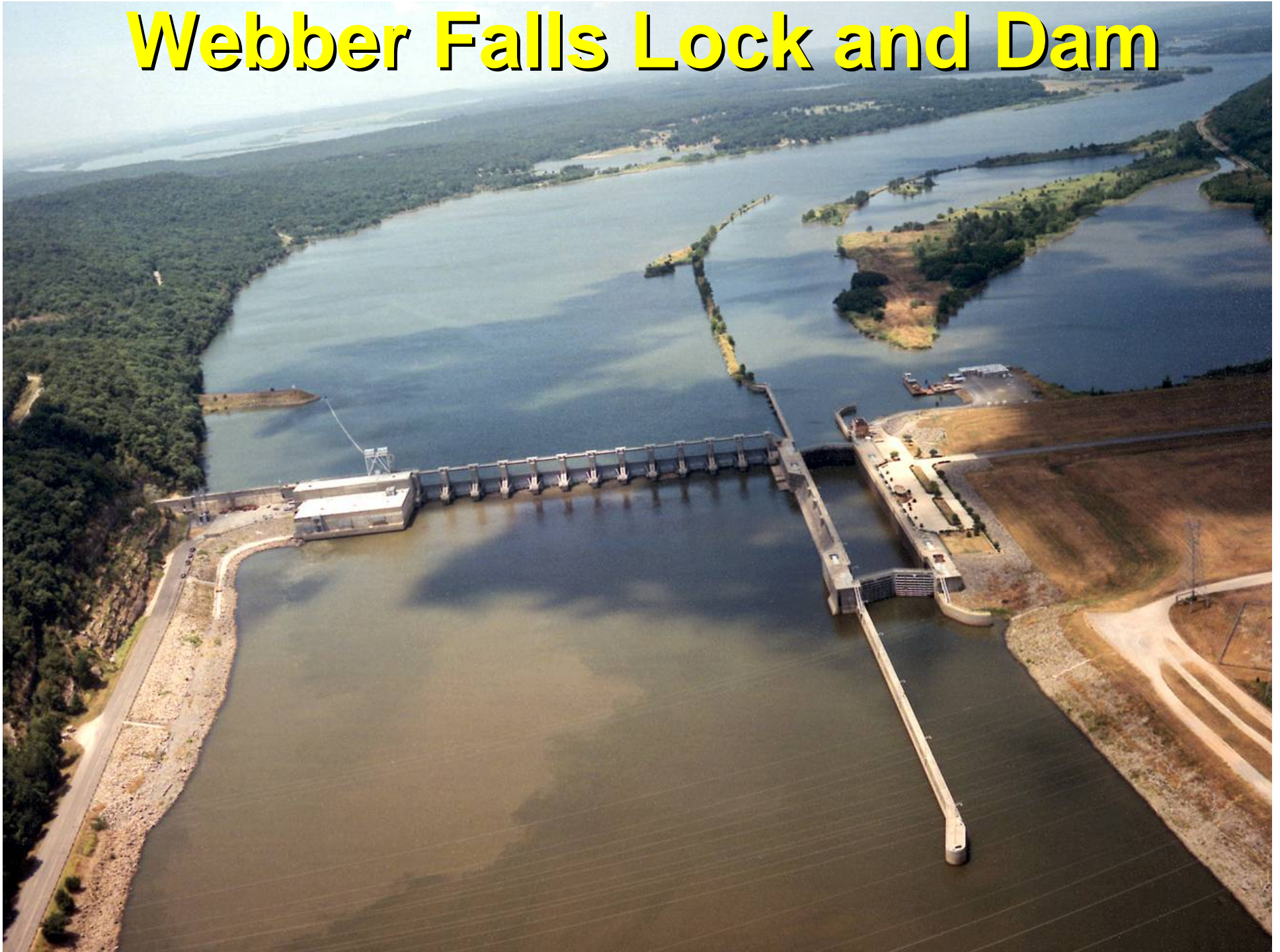
HYDROPOWER POOL

NAVIGATION POOL

INACTIVE POOL

DAM

Webber Falls Lock and Dam





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Flood Operation Individual Project



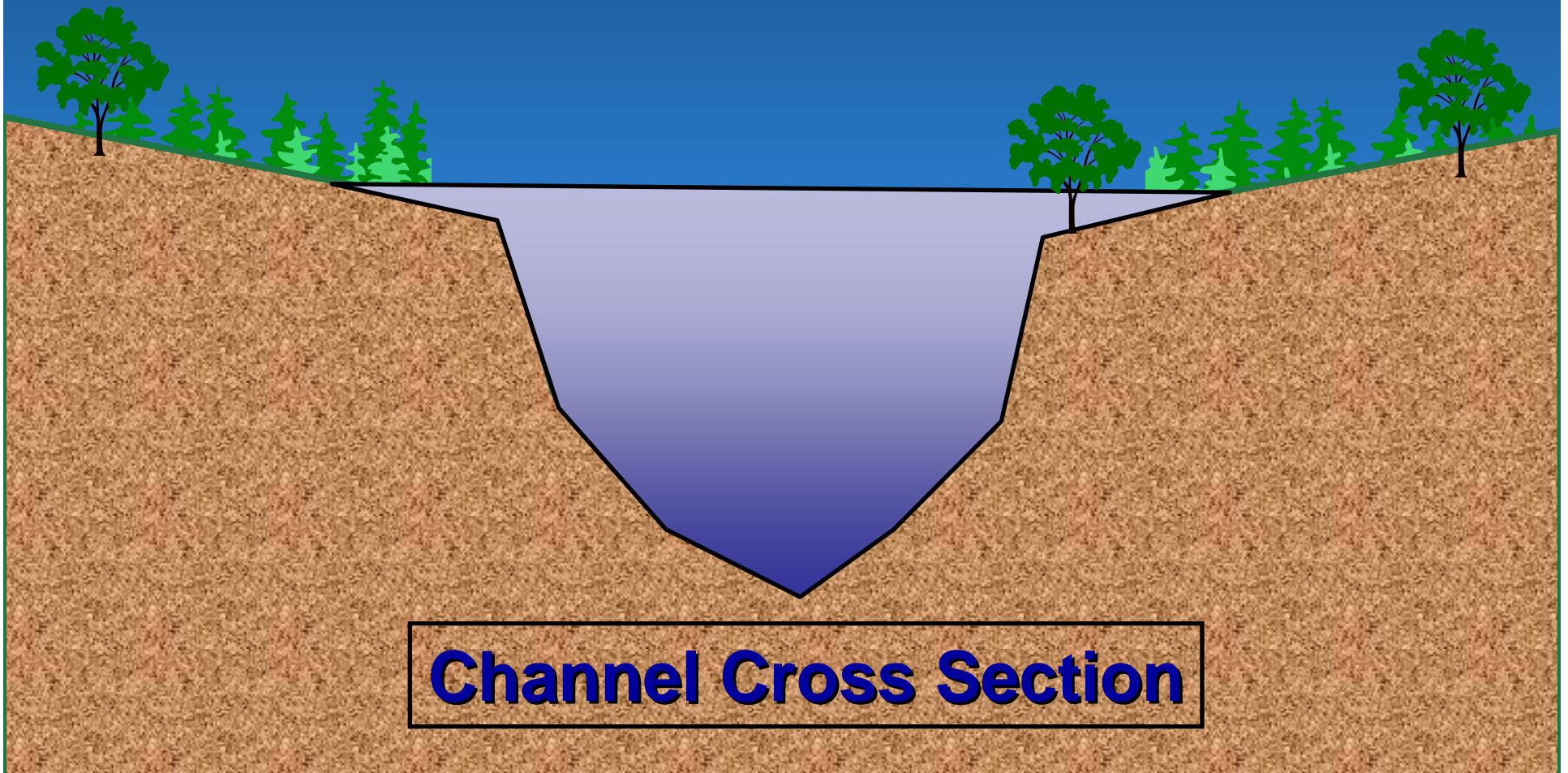
- The goal of any flood damage risk reduction operation is to not exceed the downstream bankfull capacity.
- Releases from the lake, when combined with downstream runoff will not cause the river to exceed bankfull capacity, if possible.
- Flood waters will be stored as long as possible in order to accomplish this goal.

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Bankfull Capacity



Channel Cross Section



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System Water Control Plan

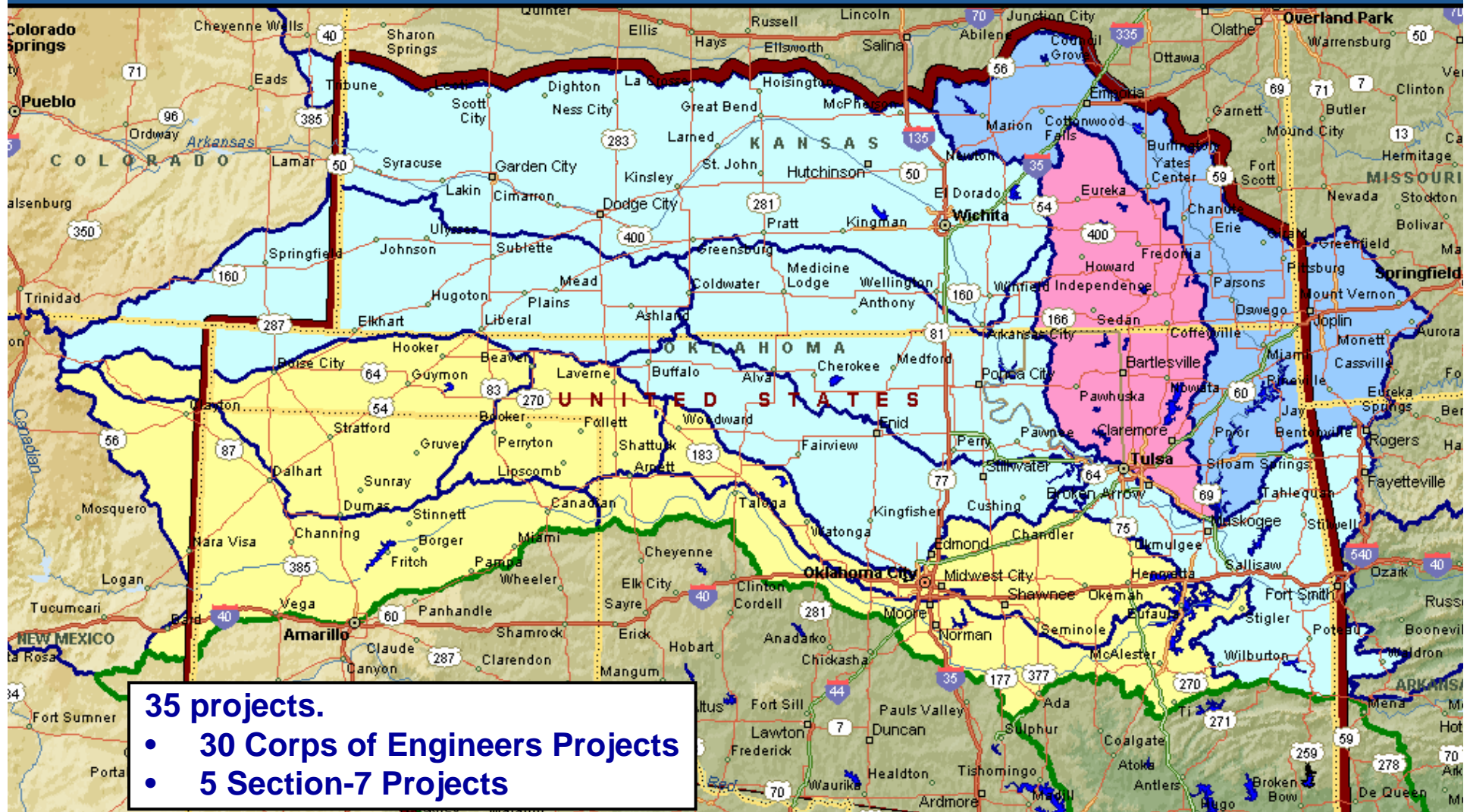


- Tulsa District has flood control projects in two river systems.
 - Arkansas River System
 - Red River System
- Each system water control plan attempts to balance the percent of storage contained in individual project flood pools.



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Arkansas River Basin Watershed Map





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Five Subsystems in the Arkansas River Basin

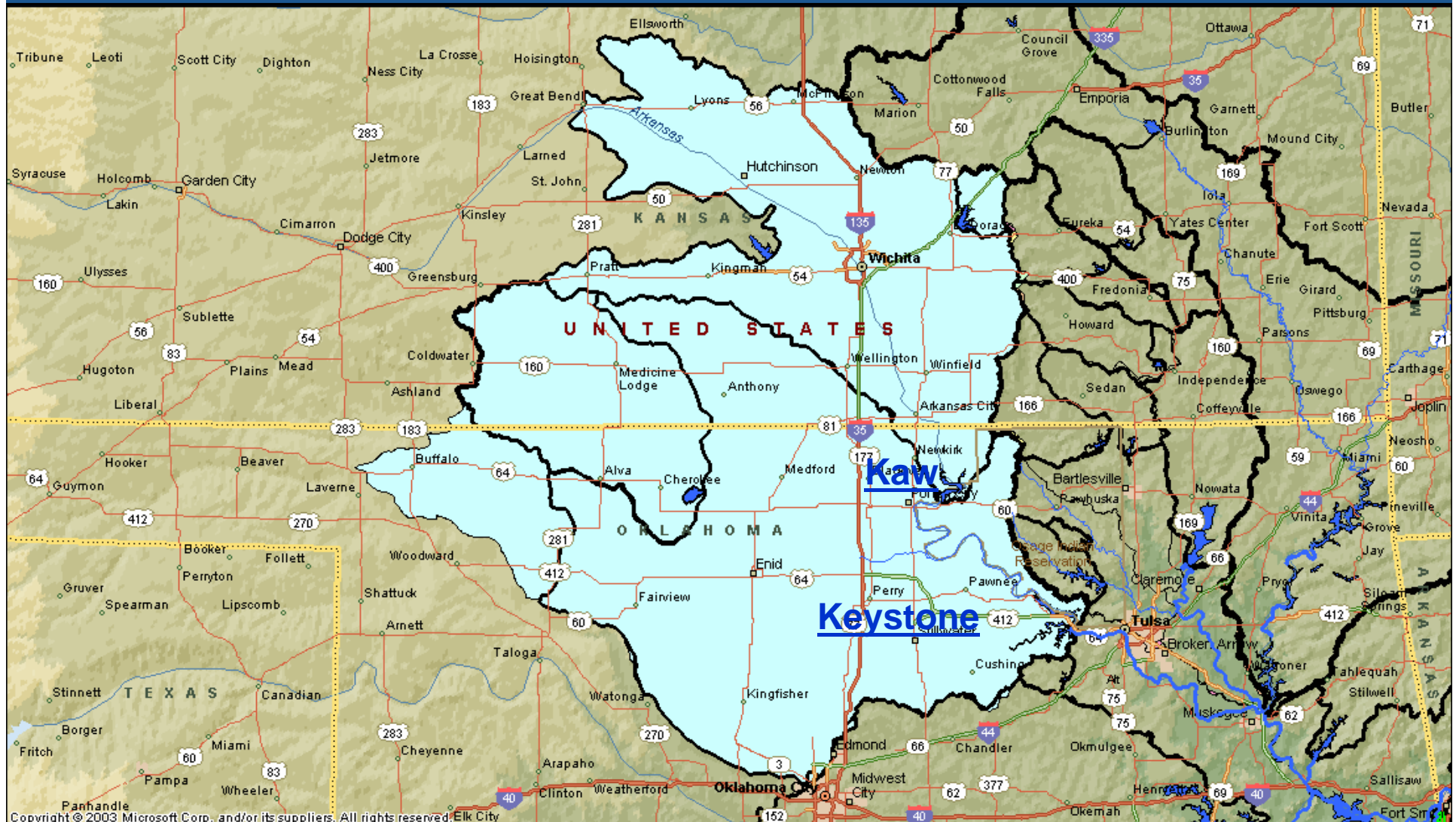


- Upper Arkansas Subsystem
- Upper Verdigris Subsystem
- Upper Grand (Neosho) Subsystem
- Lower Grand (Neosho) Subsystem
- Lower Arkansas Subsystem



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Upper Arkansas Subsystem

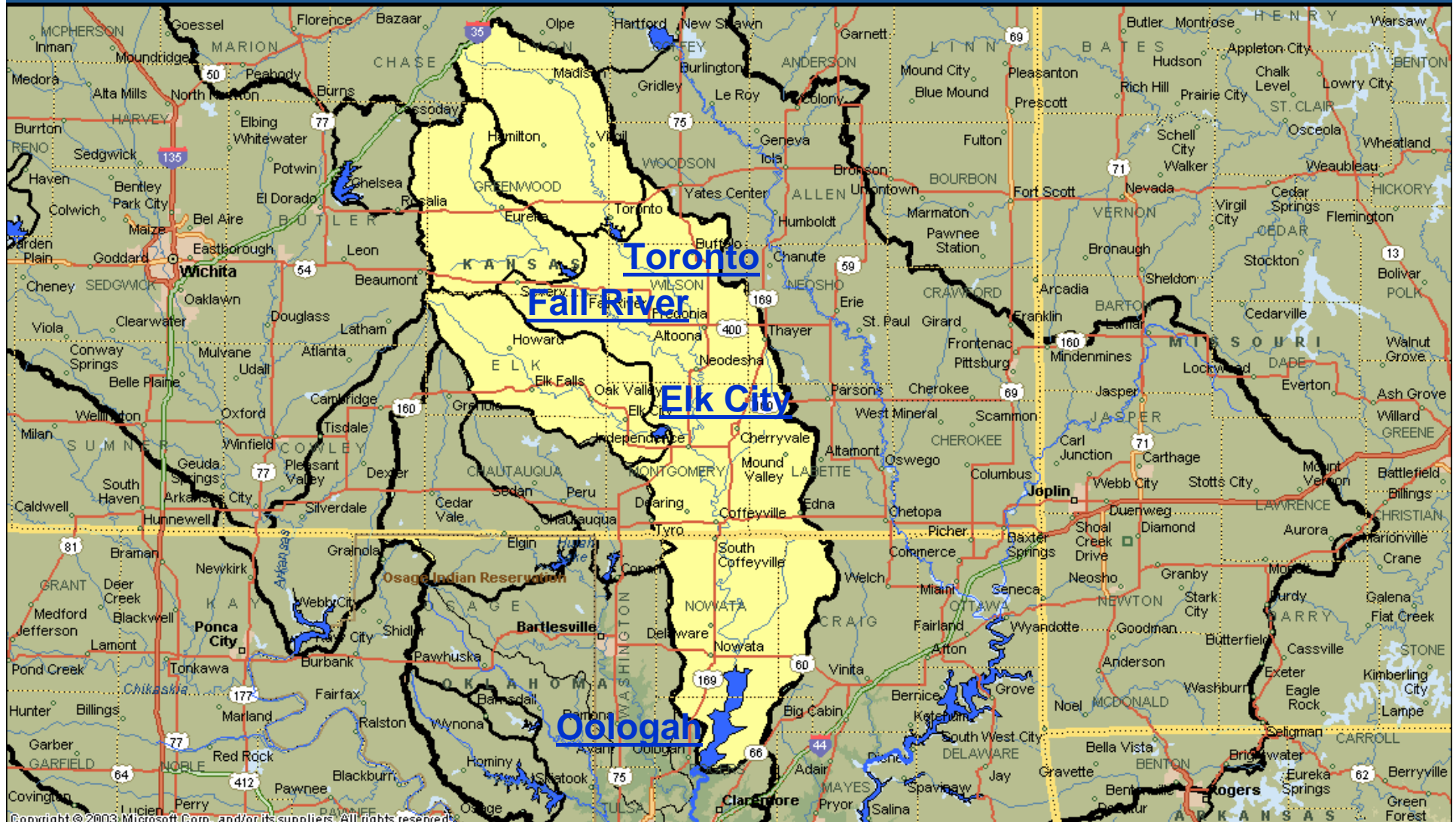




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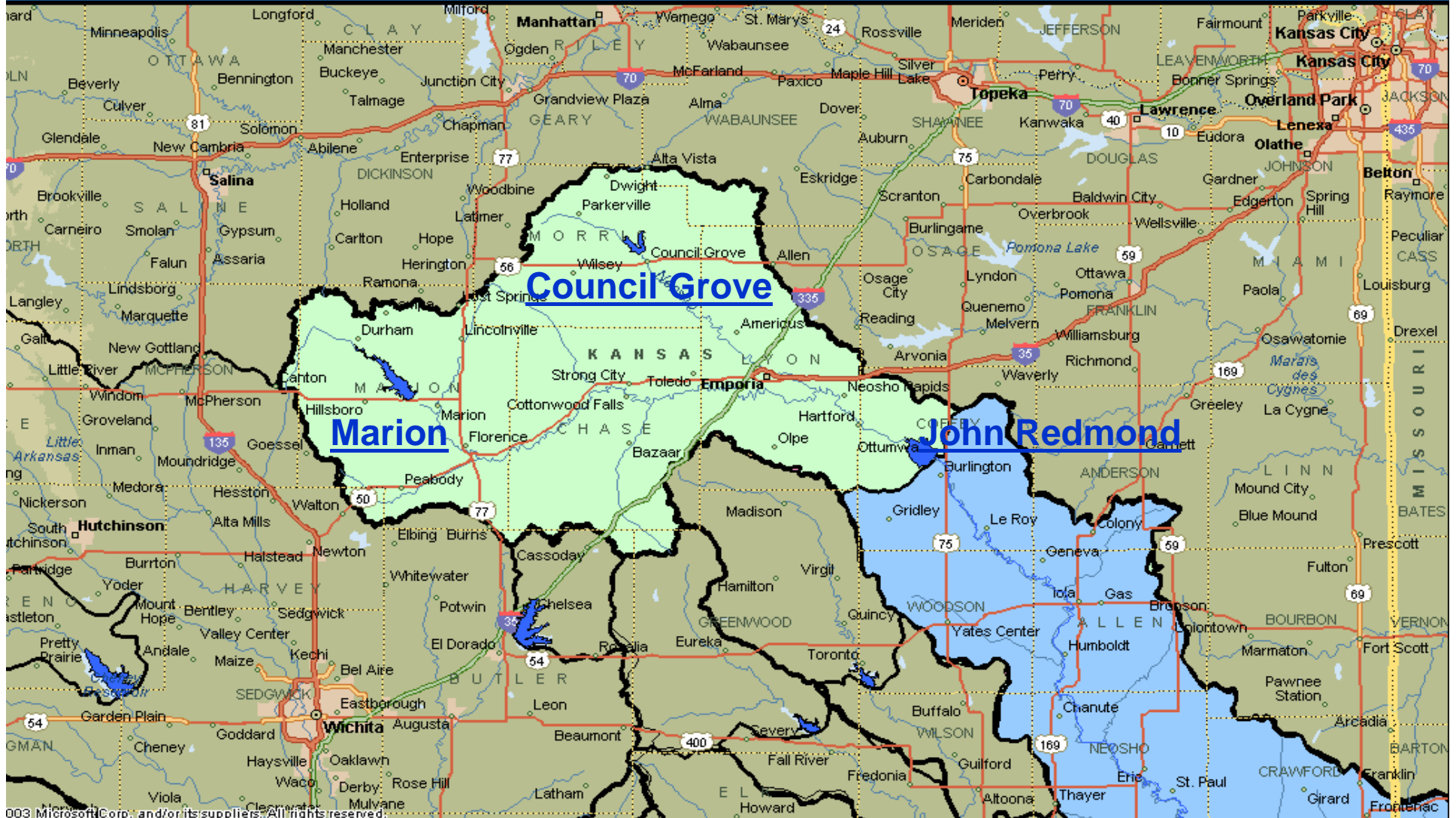
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Upper Verdigris Subsystem





Upper Grand (Neosho) Subsystem

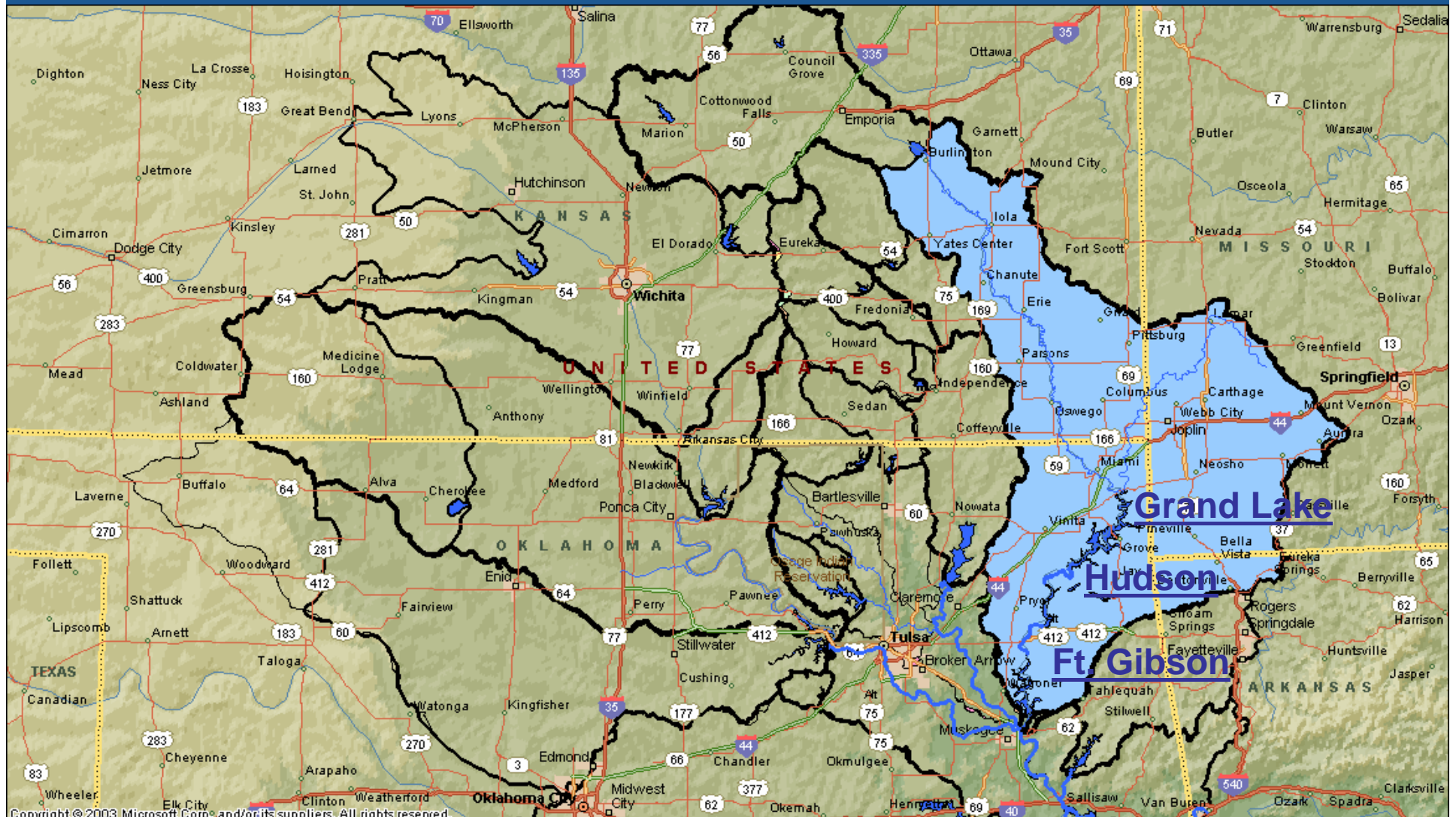




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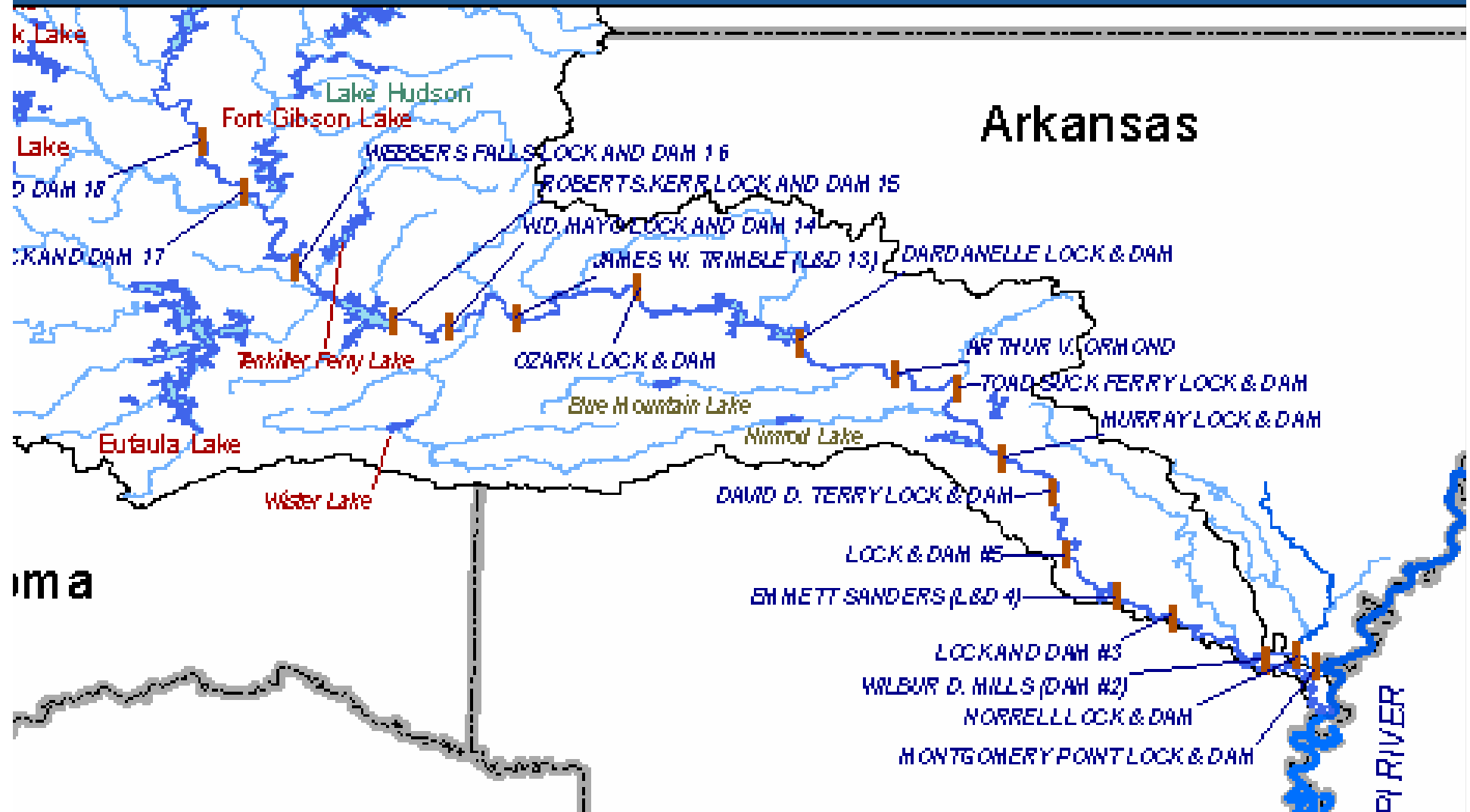
Lower Grand (Neosho) Subsystem





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Lower Arkansas Subsystem





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Arkansas River System Water Control Plan



- The system water control plan attempts to balance the percent of storage contained in individual project flood pools.
- Only projects above Van Buren, Arkansas are balanced.
- All projects above Van Buren share the control point at Van Buren.
- Flows at Van Buren are restricted to **150,000** cfs or less.



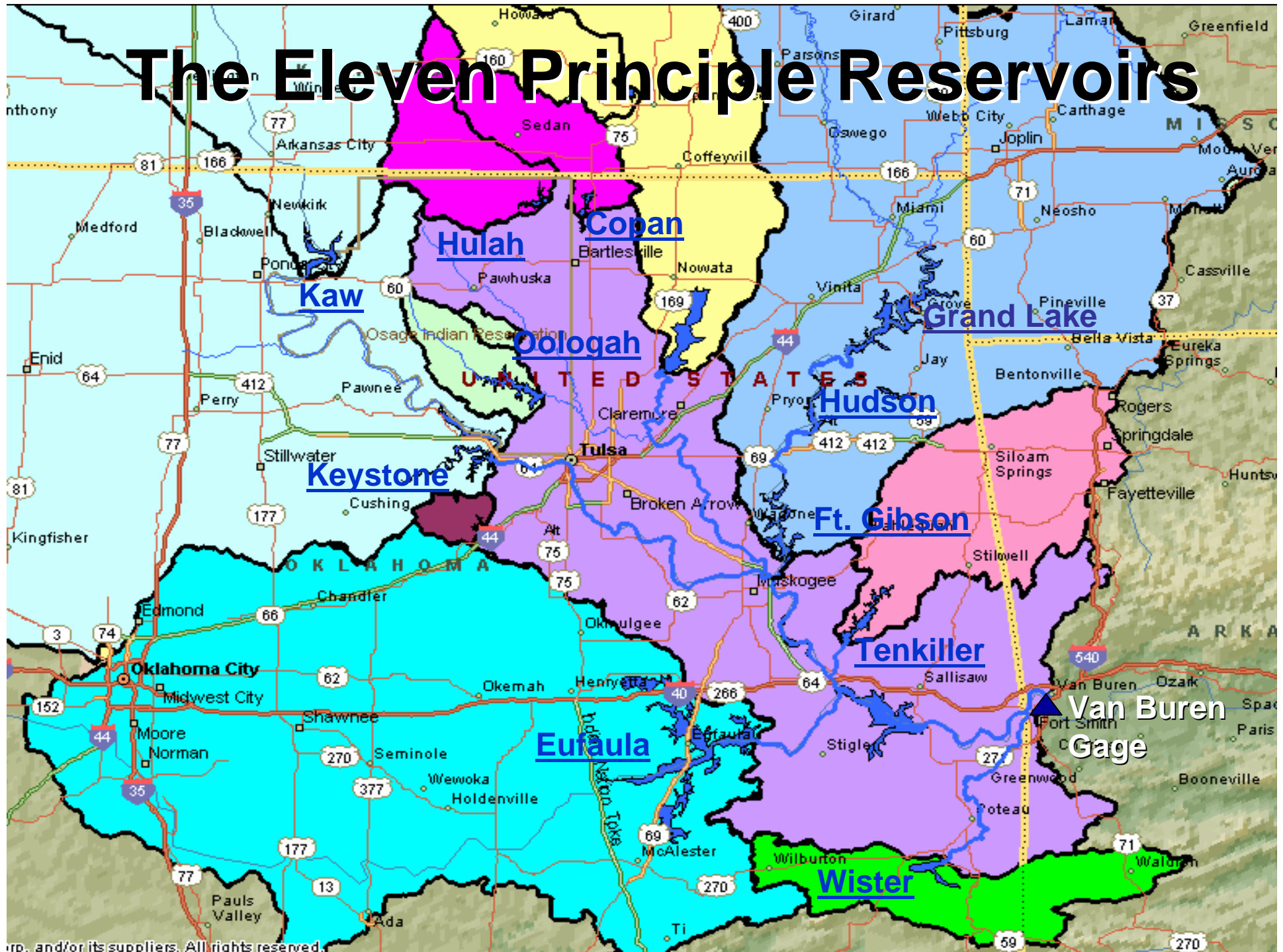
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Arkansas River System Water Control Plan



- The system water control plan focuses on eleven principle reservoirs.
 - Kaw
 - Keystone
 - Hulah
 - Copan
 - Oologah
 - Eufaula
 - Grand
 - Hudson
 - Ft. Gibson
 - Tenkiller
 - Wister
- Upstream projects in subsystems are balanced with these eleven projects.

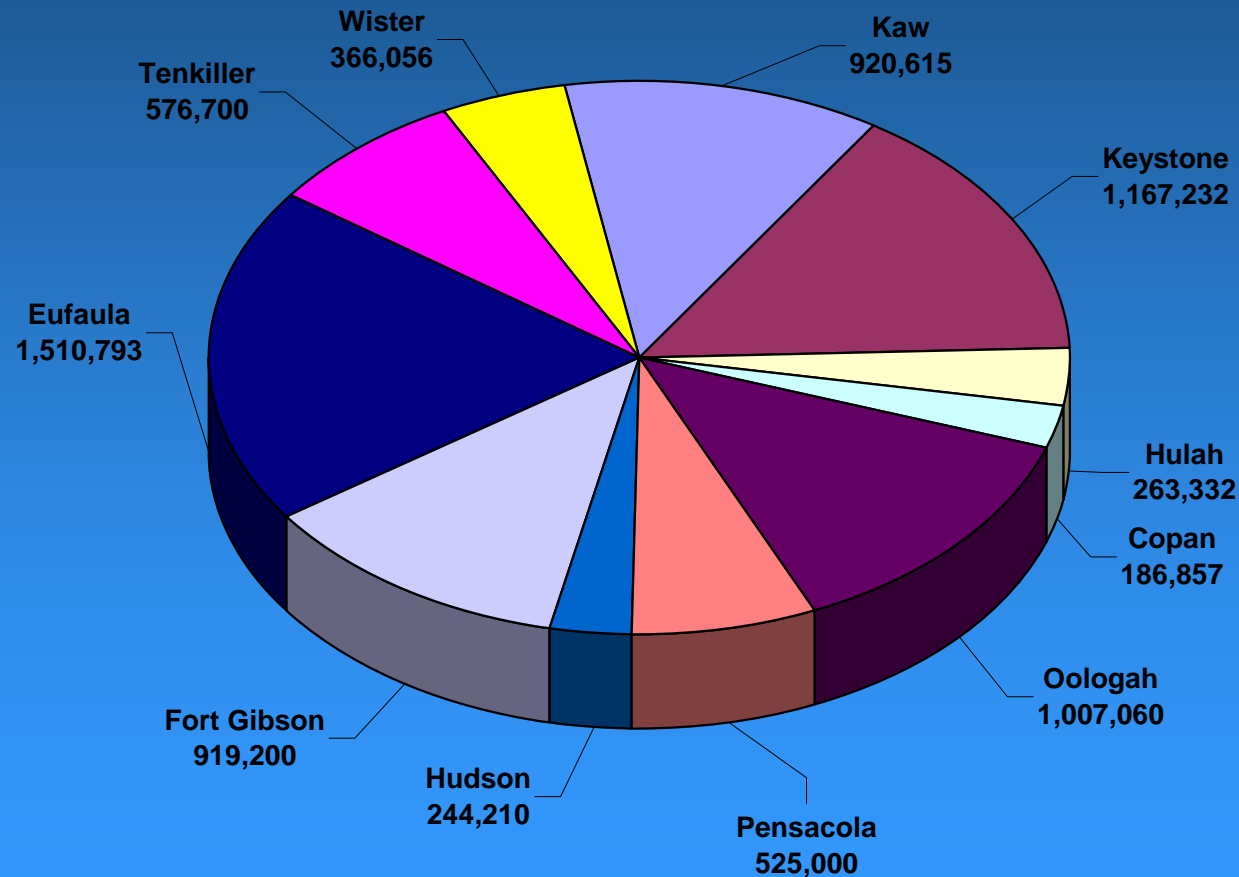
The Eleven Principle Reservoirs





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Arkansas River System Flood Storage 11 Principle Reservoirs



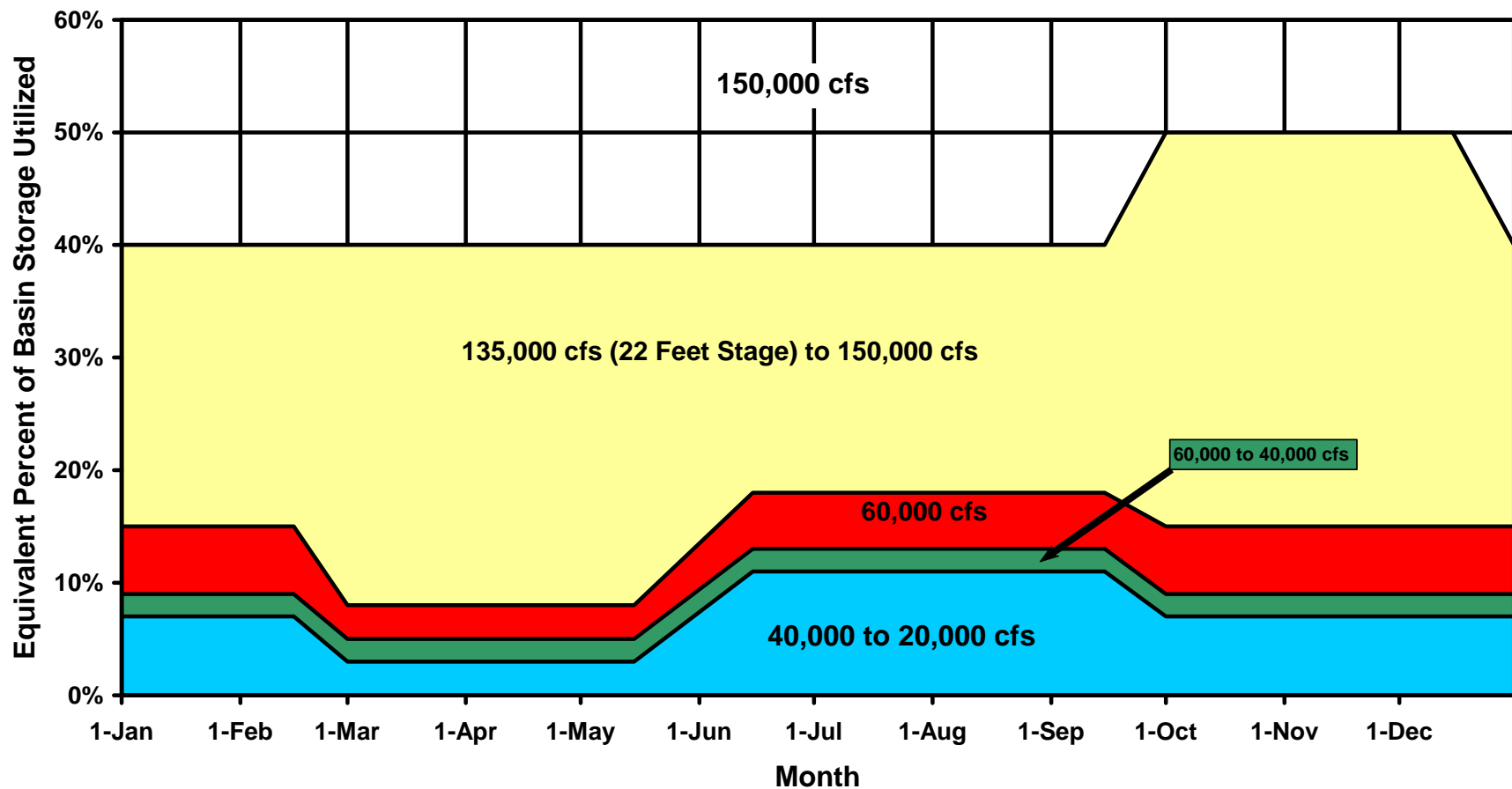
Total Flood Storage = 7,687,055 ac-ft

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Van Buren Regulating Flows



Van Buren Guide Curve

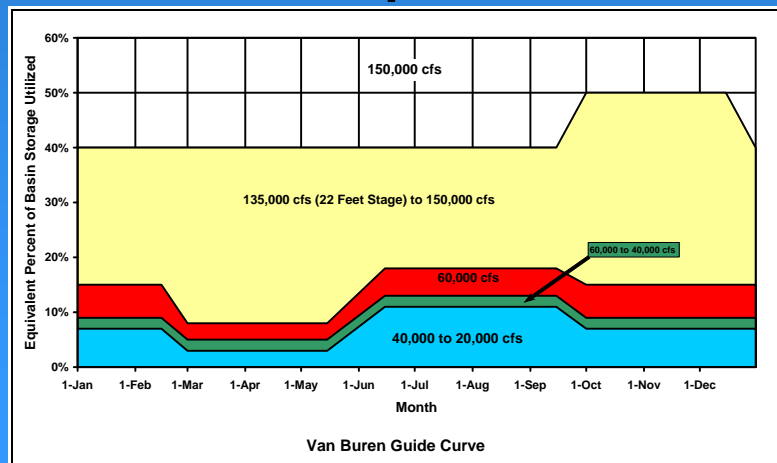


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Van Buren Guide Curve



- The yellow and white zones apply mostly to a system flood operation.
- The blue, green, and red zones apply mostly to the transition back to more normal operations after a flood event.

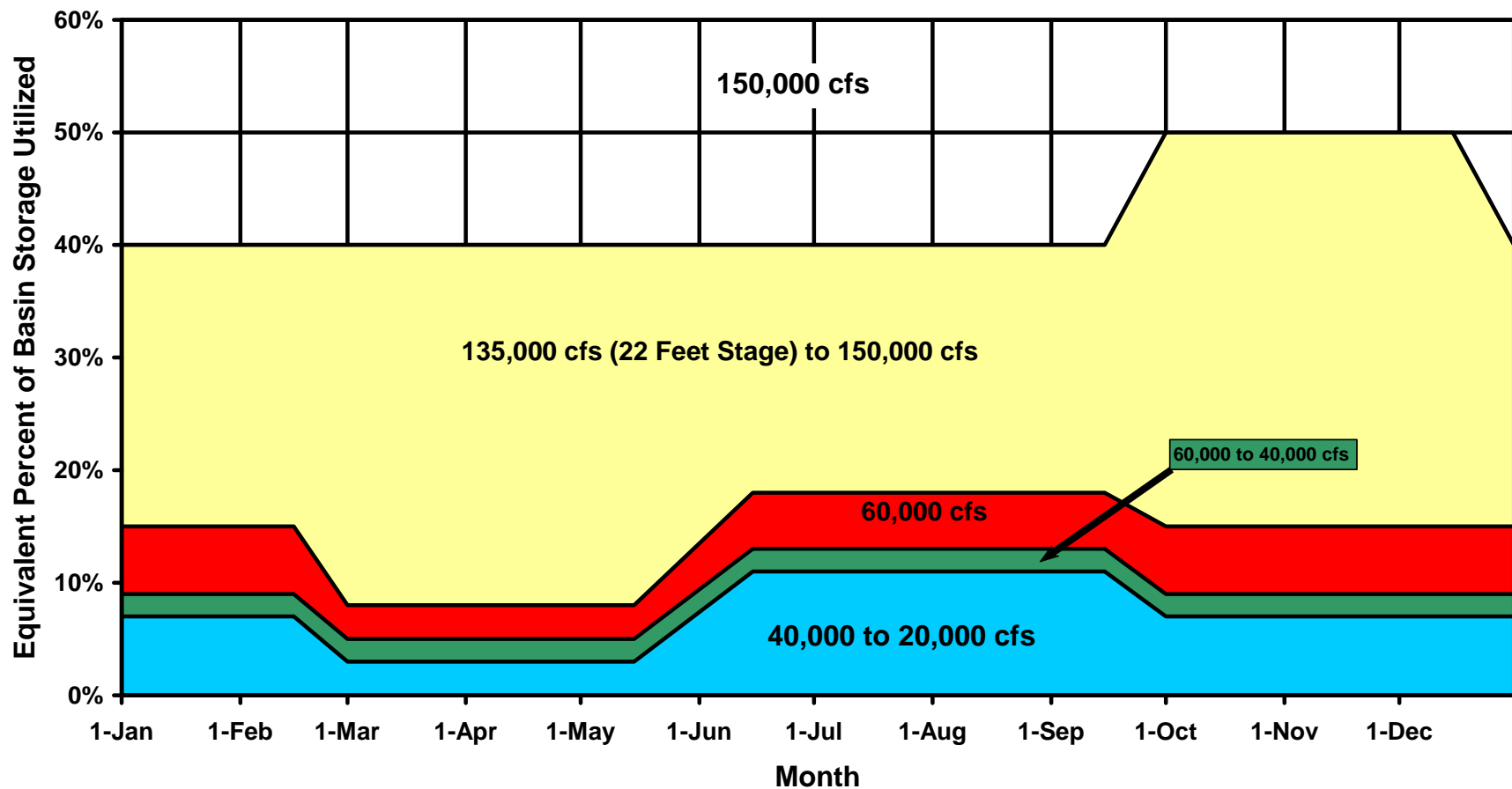


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Van Buren Regulating Flows



Van Buren Guide Curve

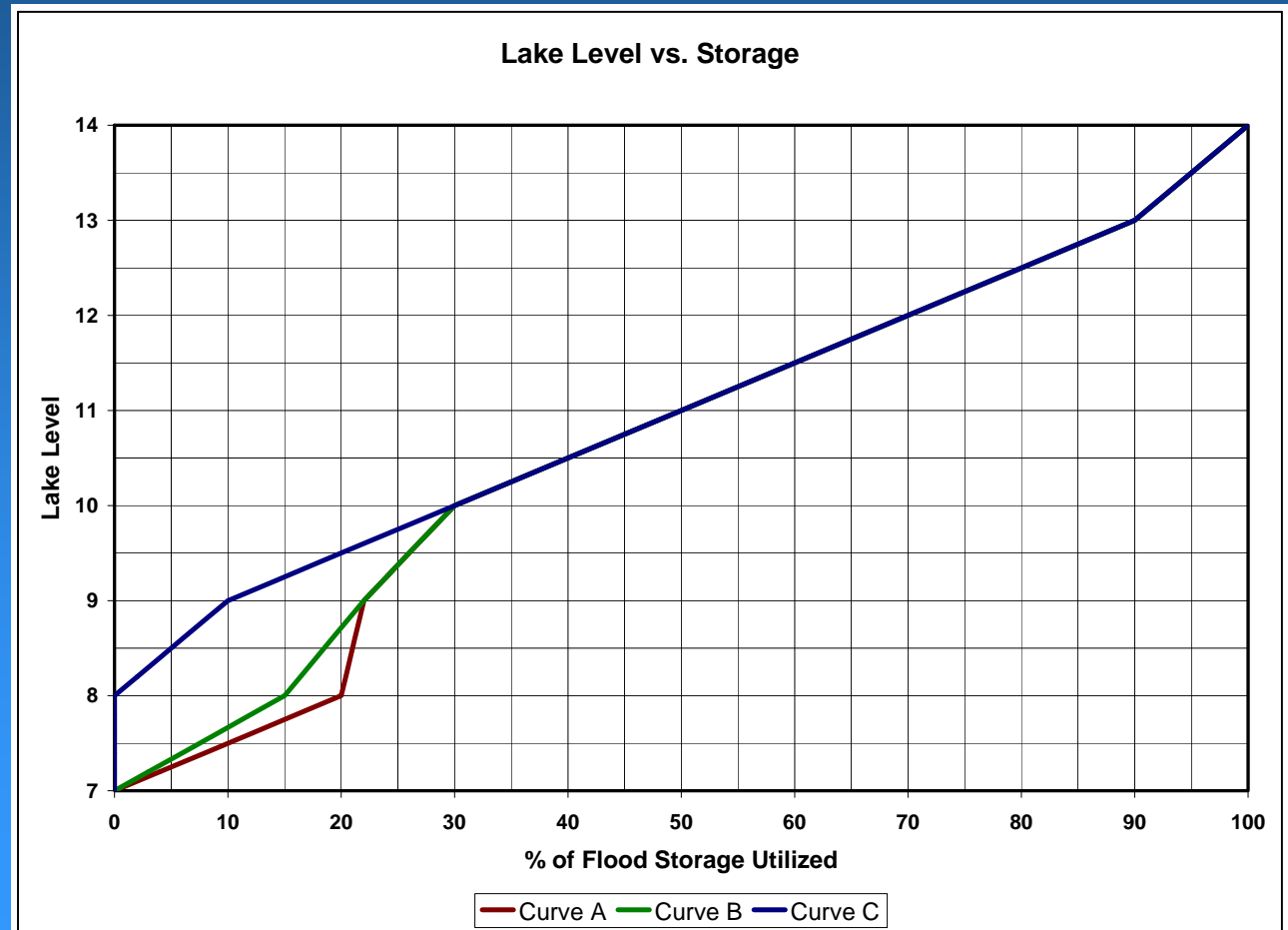


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Arkansas River System Balance



Curve A	Curve B	Curve C
Oologah	Kaw	Toronto
	Keystone	Fall River
	Tenkiller	Elk City
	Eufaula	Council Grove
		Marion
		John Redmond
		Hulah
		Copan
		Skiatook
		Birch
		Pensacola
		Hudson
		Fort Gibson
		Wister



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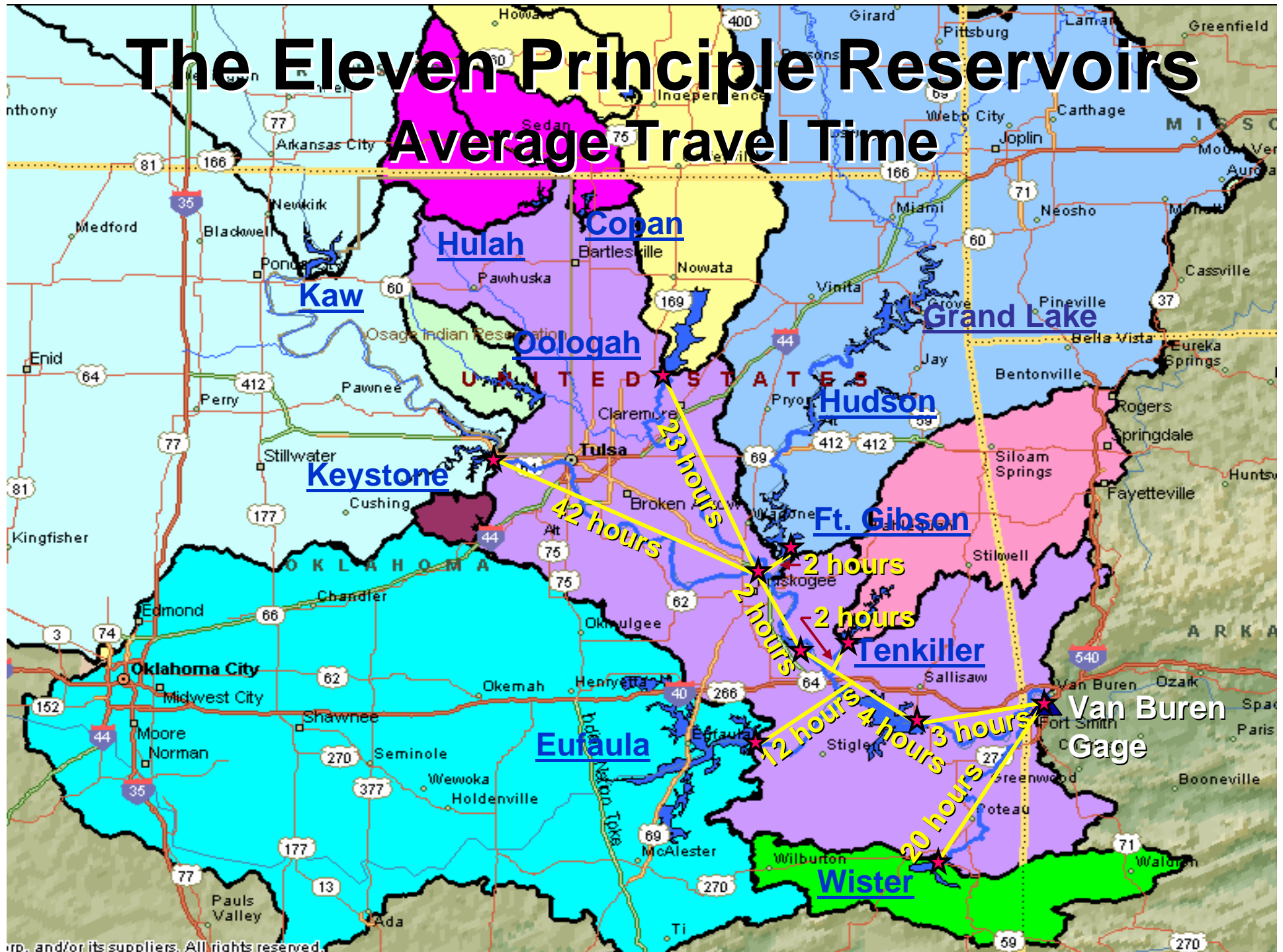
Arkansas River System Balance

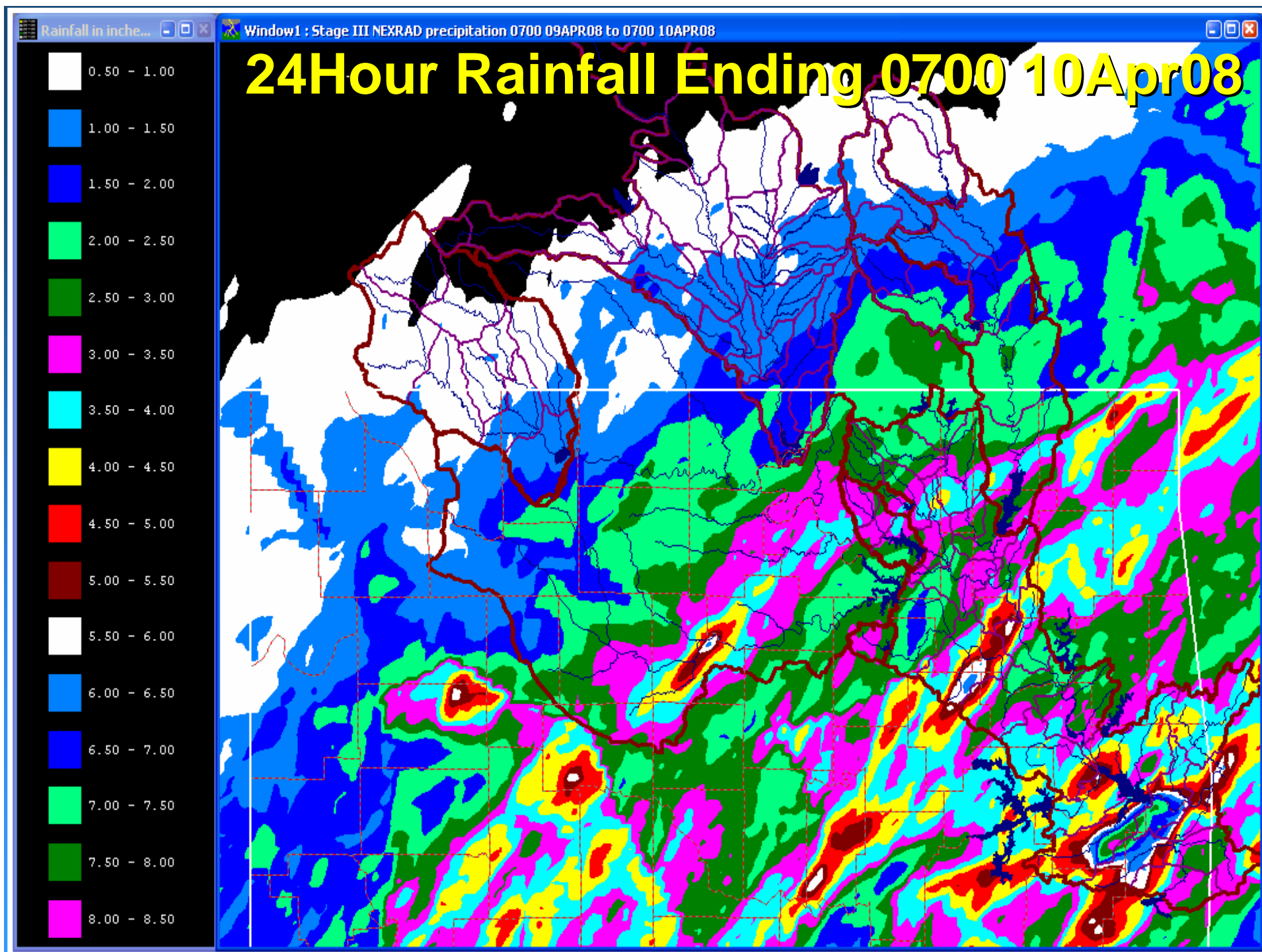


- Above 30% full, all projects are balanced equally.
- Below 30% full, projects are balanced in three groups.
- Projects in the blue group are given priority in emptying first.

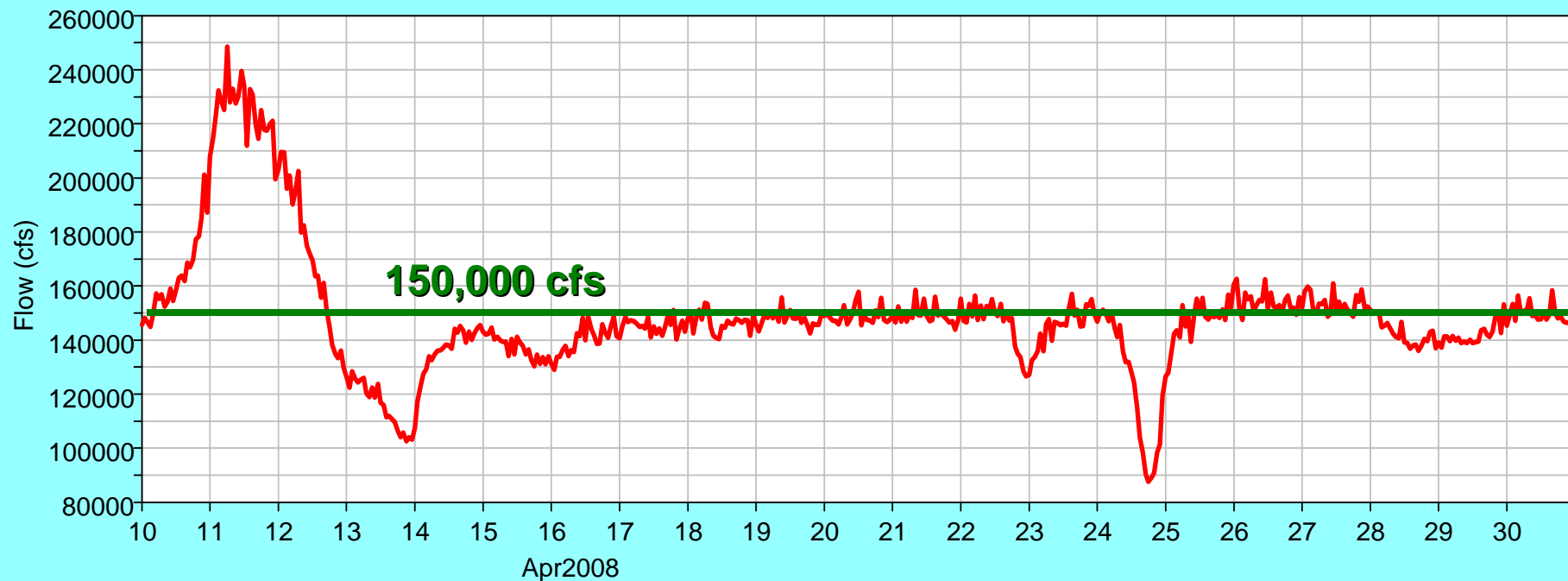
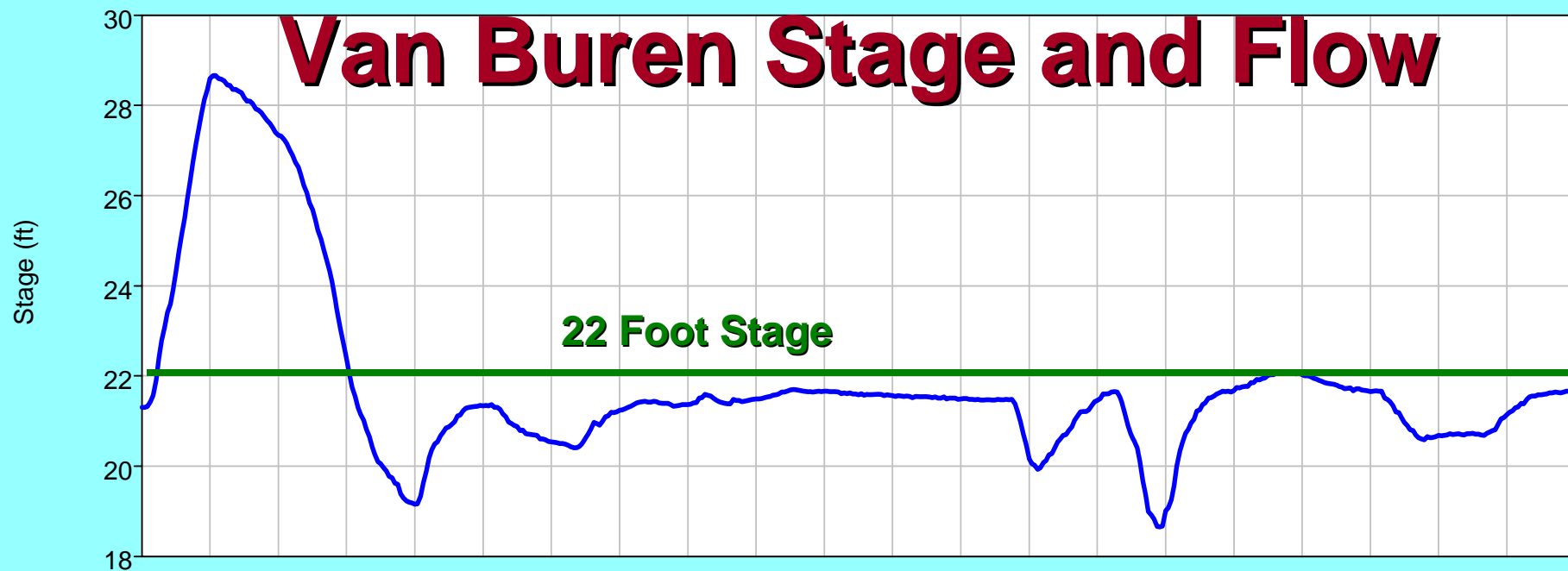
The Eleven Principle Reservoirs

Average Travel Time





Van Buren Stage and Flow

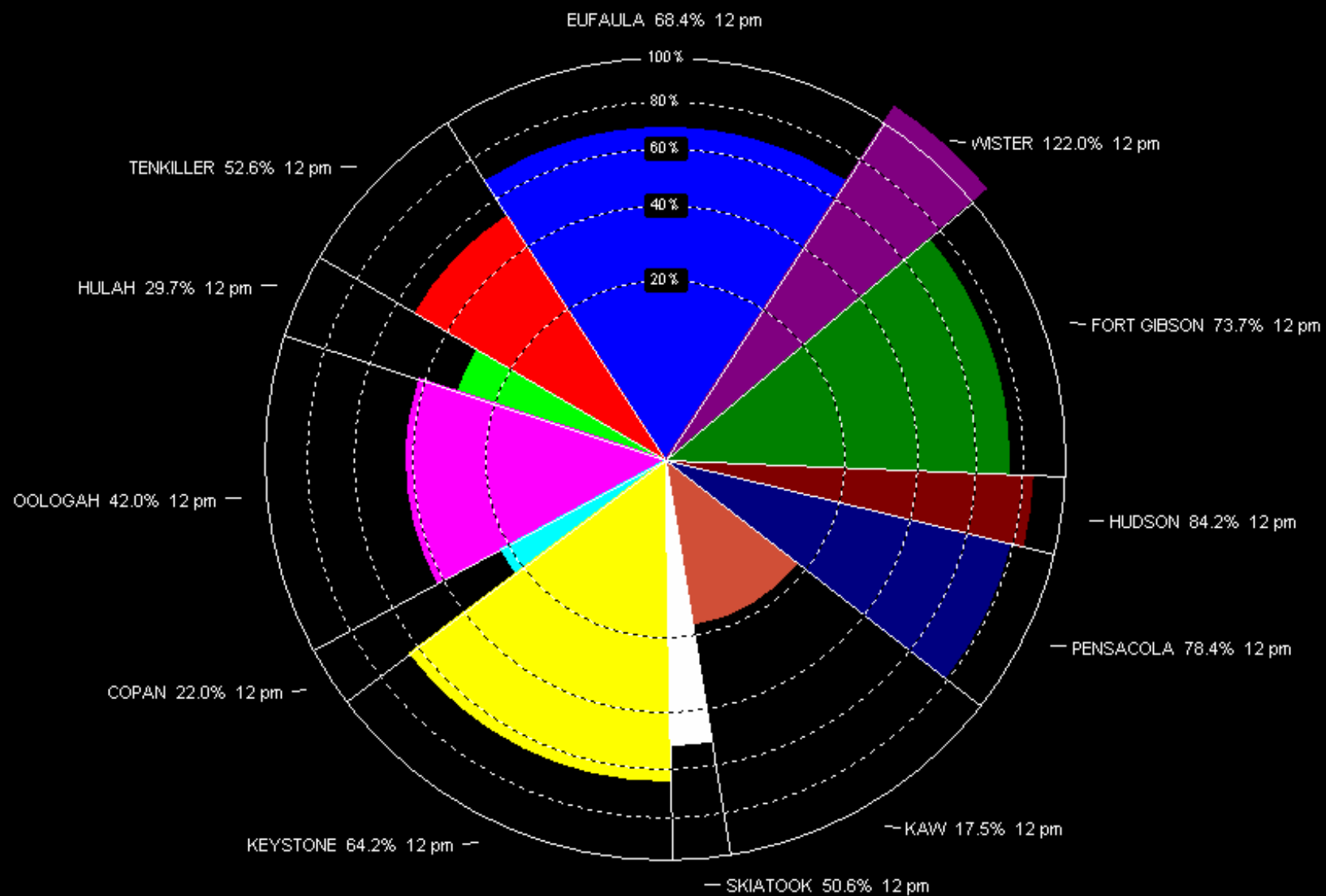


VANB OBS STAGE

FSMI OBS FLOW-LOC CUM

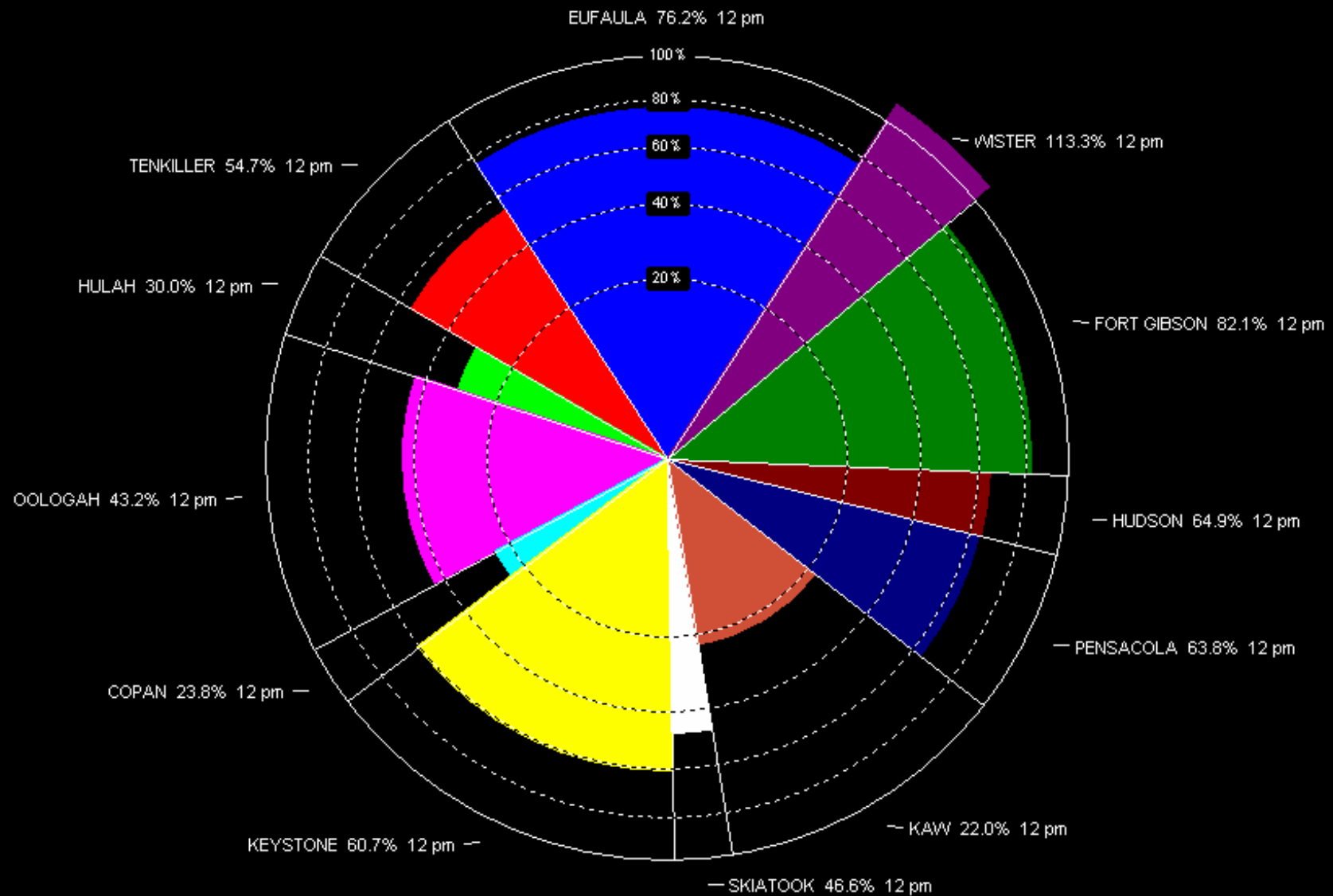
LOWER ARKANSAS
Flood Control Storage - 12APR08

Total System Flood Storage Utilized = 58.63 %



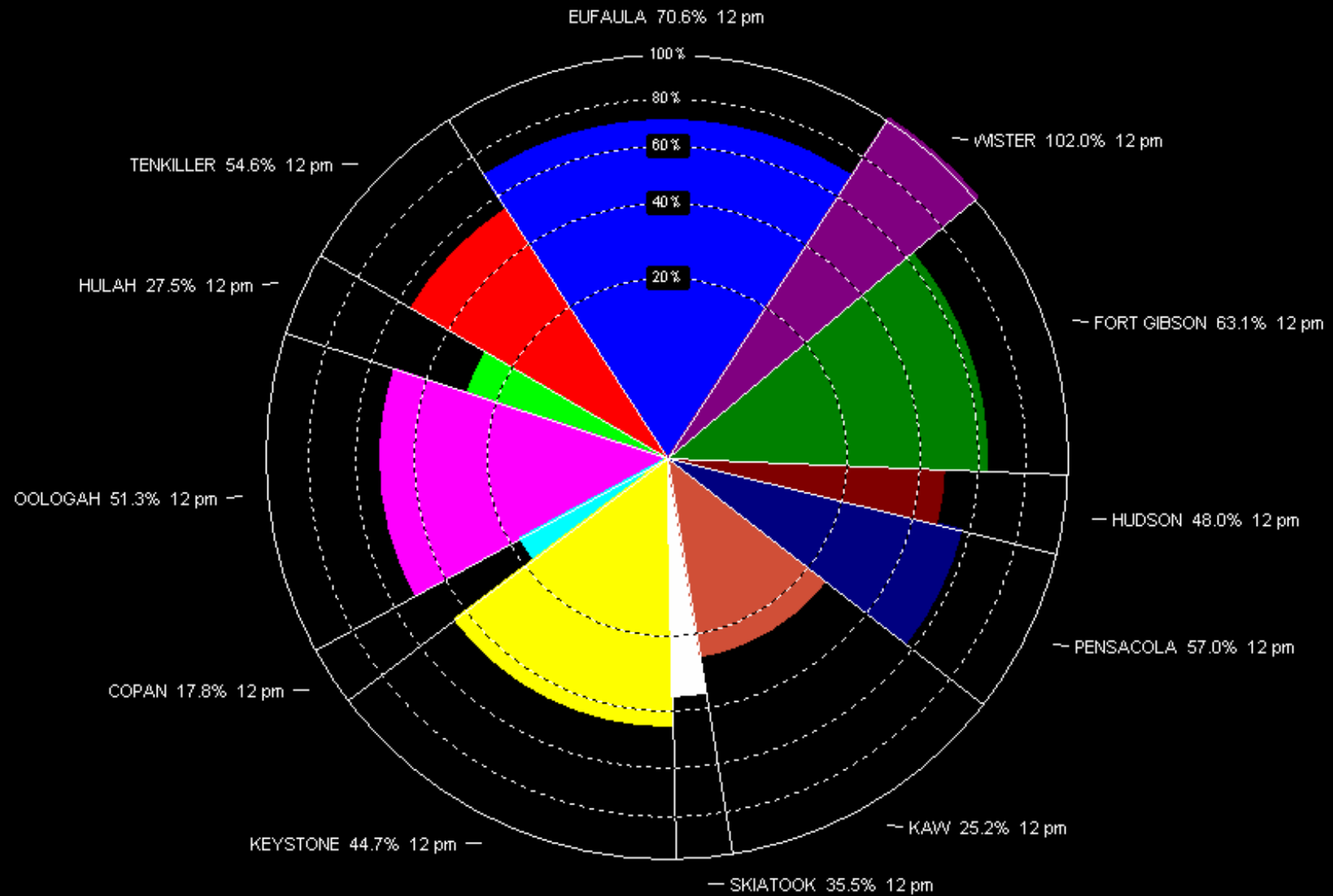
LOWER ARKANSAS
Flood Control Storage - 15APR08

Total System Flood Storage Utilized = 59.34 %



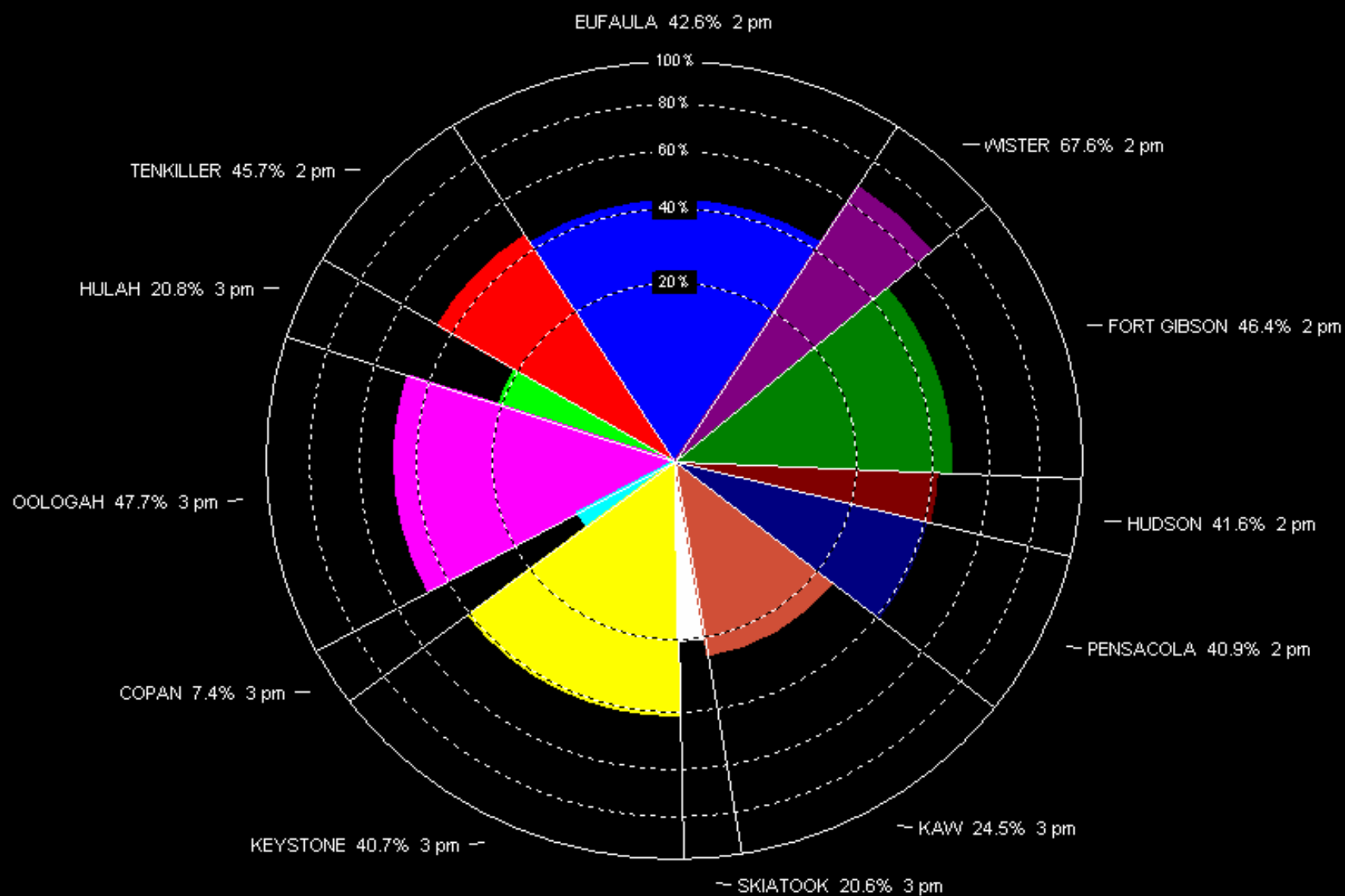
LOWER ARKANSAS
Flood Control Storage - 20APR08

Total System Flood Storage Utilized = 53.09 %



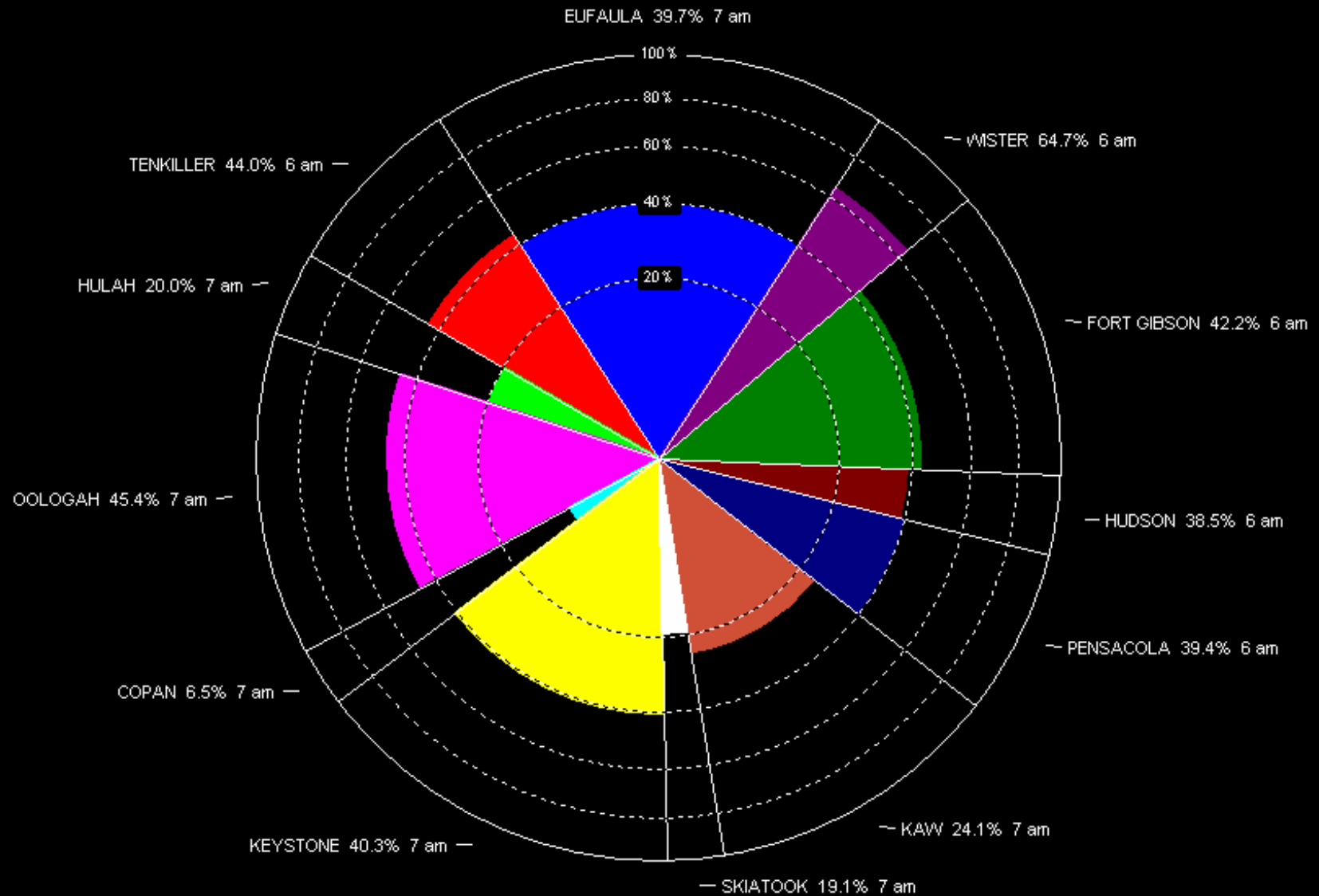
LOWER ARKANSAS
Flood Control Storage - 29APR08

Total System Flood Storage Utilized = 40.47 %



LOWER ARKANSAS
Flood Control Storage - 30APR08

Total System Flood Storage Utilized = 38.48 %

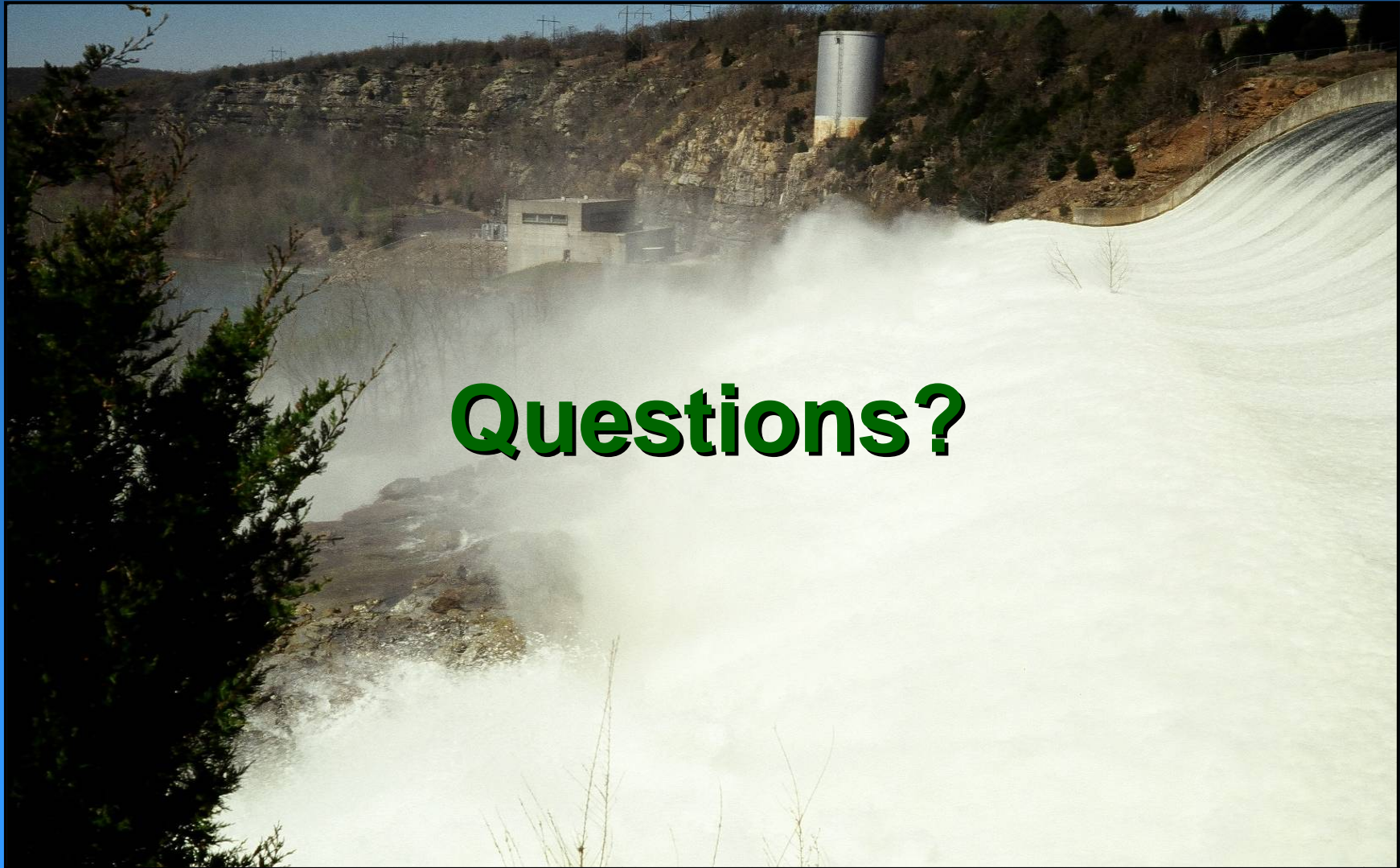
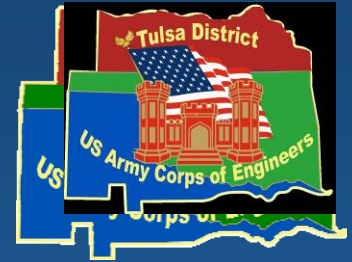




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Questions?